

WHAT IS CLAIMED IS:

1. An electric power and cooling system for supplying electric power and conditioned air to an aircraft having at least one engine comprising a single shaft, a power turbine mounted on the shaft for receiving fresh pressurized air from said engine, a cooling turbine mounted on said shaft and receiving said fresh pressurized air from said engine, a generator mounted on said shaft, and a fan mounted on said shaft for creating a flow of air for cooling said fresh pressurized air.
2. An electric power and cooling system according to claim 1, further comprising a precooler heat exchanger disposed between said at least one engine and said power turbine, said precooler heat exchanger receiving at least one of mid stage bleed air and high stage bleed air from said at least one engine and delivering cooled bled air to said power turbine.
3. An electric power and cooling system according to claim 2, further comprising means for delivering first stage fan air to said precooler heat exchanger for use as a heat sink.
4. An electric power and cooling system according to claim 2, wherein said precooler heat exchanger is mounted in a nacelle of said at least one engine.
5. An electric power and cooling system according to claim 2, further comprising a primary heat exchanger disposed between the precooler heat exchanger and said power turbine for removing heat from said bleed air.

6. An electric power and cooling system according to claim 5, wherein said primary heat exchanger is mounted in a ram air duct.
7. An electric power and cooling system according to claim 5, further comprising a secondary heat exchanger disposed between said primary heat exchanger and said cooling turbine.
8. An electric power and cooling system according to claim 7, further comprising said secondary heat exchanger being mounted in a ram air duct upstream of said primary heat exchanger.
9. An electric power and cooling system according to claim 2, further comprising a secondary heat exchanger being disposed between said precooler heat exchanger and said cooling turbine for removing additional heat from said cooled bleed air so that said air exiting said secondary heat exchanger has a temperature near ambient.
10. An electric power and cooling system according to claim 9, wherein said secondary heat exchanger is mounted in a ram air duct and uses ram air as a heat sink.
11. An electric power and cooling system according to claim 10, further comprising means for delivering said near ambient temperature air from said secondary heat exchanger to at least one of said cooling turbine and said power turbine to generate power for driving said generator.
12. An electric power and cooling system according to claim 11, further comprising means for dumping air exiting the power turbine overboard the aircraft.

13. An electric power and cooling system according to claim 11, further comprising a condenser for removing moisture from air exiting said cooling turbine and creating a flow of cooled dry air.

14. An electric power and cooling system according to claim 13, further comprising a mix chamber for mixing said cooled dry air with recirculated air from an aircraft cabin and means for delivering mixed air from said mix chamber to said aircraft cabin.

15. An electric power and cooling system according to claim 11, further comprising means for removing moisture from said bleed air prior to delivering said bleed air to said cooling turbine and said moisture removing means including a loop containing a reheater, a condenser, and a water collector.

16. An electric power and cooling system according to claim 13, further comprising means for delivering a flow of cooled dry bleed air from said condenser directly to a flight deck of said aircraft.

17. An electric power and cooling system according to claim 1, further comprising means for supplying electric power generated by said generator to aircraft electric systems.

18. An electric power and cooling system according to claim 1, further comprising means for supplying electric power generated by said generator to electric pumps for operating aircraft hydraulic systems.

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